AMENDMENT TO THE CLAIMS

Claims 1-11 (Canceled)

12. (Currently Amended) A high pressure discharge lamp ~~according to claim 6~~, comprising:

a quartz glass bulb;

conductive elements, said conductive elements being airtightly sealed at sealing portions of said quartz glass bulb; and

a pair of electrodes, each electrode of said pair of electrodes being disposed so as to be opposite the other and each of said electrodes being connected to one of said conductive elements,

wherein R_{max} of a contacting portion of each of said electrodes is about 5μm or less,

wherein R_{max} is a maximum of an absolute value of a difference between a distance from an axial center of each of said electrodes to a particular point on a surface of each of said electrodes and a mean value of the distance, and

wherein ~~the~~ a maximum value of ~~the~~ a surface roughness of a portion other than ~~the~~ an end portion of each of said electrodes is in ~~the~~ a range between about 5 μm and 12 μm.

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13. (Currently Amended) A high pressure discharge lamp ~~according to claim 6~~, comprising:

a quartz glass bulb;

conductive elements, said conductive elements being airtightly sealed at sealing portions of said quartz glass bulb; and

a pair of electrodes, each electrode of said pair of electrodes being disposed so as to be opposite the other and each of said electrodes being connected to one of said conductive elements,

wherein R_{max} of a contacting portion of each of said electrodes is about 5μm or less,

wherein R_{max} is a maximum of an absolute value of a difference between a distance from an axial center of each of said electrodes to a particular point on a surface of each of said electrodes and a mean value of the distance, and

wherein ~~the~~ a maximum value of ~~the~~ a surface roughness of a portion of other than ~~the~~ an end portion of each of said electrodes is in ~~the~~ a range between about 7 μm and 9 μm.

14-19. (Canceled)

20. (Currently Amended) ~~The~~ A high pressure discharge lamp ~~according to claim 1~~, comprising:

a quartz glass bulb;

a conductive element which is airtightly sealed at a sealing portion of said quartz glass bulb; and

a pair of electrodes, each electrode of said pair of electrodes being disposed in said quartz glass bulb so as to be opposite the other and said each electrode of said pair of electrodes being connected to said conductive element,

wherein a part of said each electrode of said pair of electrodes is sealed with said quartz glass bulb at said sealing portion so as to generate a contacting portion formed by the part of each electrode of said pair of electrodes and said quartz glass bulb, and

a maximum length L_{max} of the contacting portion is defined as:

L_{max} (mm) $\leq$ 200/(PxD); and

a minimum length, L_{min} of the contacting portion is defined as:

L_{min} (mm) $\geq$ 0.8/ ($D^2 \times \pi$) or

L_{min} (mm) $\geq$ 0.7 whichever is longer,

where D is the diameter (mm) of the corresponding electrode of said pair of electrodes and P is the power (W) supplied to the corresponding electrode of said pair of electrodes, and

wherein said contacting portion covers a distance L from the sealing portion to ~~the~~ an end of the electrode, said end of said electrode terminating inside and beyond ~~the~~ an edge of a foil.

21. (Currently Amended) ~~The~~ A high pressure discharge lamp ~~according to claim 1~~, comprising:

a quartz glass bulb;

a conductive element which is airtightly sealed at a sealing portion of said quartz glass bulb; and

a pair of electrodes, each electrode of said pair of electrodes being disposed in said quartz glass bulb so as to be opposite the other and said each electrode of said pair of electrodes being connected to said conductive element,

wherein a part of said each electrode of said pair of electrodes is sealed with said quartz glass bulb at said sealing portion so as to generate a contacting portion formed by the part of each electrode of said pair of electrodes and said quartz glass bulb, and

a maximum length L_{max} of the contacting portion is defined as:

L_{max} (mm) < 200/(PxD); and

a minimum length, L_{min} of the contacting portion is defined as:

L_{min} (mm) ≥ 0.8/ (D^2x π) or

L_{min} (mm) ≥ 0.7 whichever is longer,

where D is the diameter (mm) of the corresponding electrode of said pair of electrodes and P is the power (W) supplied to the corresponding electrode of said pair of electrodes, and

wherein said power is in a range between 120-200 W.

22. (Canceled)

23. (Currently Amended) ~~The~~ A high pressure discharge lamp ~~according to claim 1~~, comprising:

a quartz glass bulb;

a conductive element which is airtightly sealed at a sealing portion of said quartz glass bulb; and

a pair of electrodes, each electrode of said pair of electrodes being disposed in said quartz glass bulb so as to be opposite the other and said each electrode of said pair of electrodes being connected to said conductive element,

wherein a part of said each electrode of said pair of electrodes is sealed with said quartz glass bulb at said sealing portion so as to generate a contacting portion formed by the part of each electrode of said pair of electrodes and said quartz glass bulb, and

a maximum length L_{max} of the contacting portion is defined as:

L_{max} (mm) < 200/(PxD); and

a minimum length, L_{min} of the contacting portion is defined as:

L_{min} (mm) ≥ 0.8/ (D^2x π) or

L_{min} (mm) ≥ 0.7 whichever is longer,

where D is the diameter (mm) of the corresponding electrode of said pair of electrodes and P is the power (W) supplied to the corresponding electrode of said pair of electrodes, and

wherein said diameter of said each electrode is between 0.4 - 0.8 mm.

24-25. (Canceled)

26. (Currently Amended) ~~The~~ A high pressure discharge lamp ~~according to claim 6~~, comprising:

a quartz glass bulb;

conductive elements, said conductive elements being airtightly sealed at sealing portions of said quartz glass bulb; and

a pair of electrodes, each electrode of said pair of electrodes being disposed so as to be opposite the other and each of said electrodes being connected to one of said conductive elements,

wherein R_{max} of a contacting portion of each of said electrodes is about 5μm or less,

wherein R_{max} is a maximum of an absolute value of a difference between a distance from an axial center of each of said electrodes to a particular point on a surface of each of said electrodes and a mean value of the distance, and

wherein said contacting portion covers a distance from the sealing portion to ~~the~~ an end of the electrode, said end of said electrode terminating inside and beyond ~~the~~ an edge of a foil.

between about 5 μ m and 12 μ m.

In yet another aspect of the invention, the maximum value of the surface roughness of a portion other than the end portion of each of the electrodes is in the range between about 7 μ m and 9 μ m.

In yet another aspect of the invention, mercury vapor is contained in the high pressure discharge lamp in an amount between about 0.12 and 0.3 mg/mm^3.

In yet another aspect of the invention, a halogen gas is contained in the high pressure discharge lamp in an amount between about 10^{-8} and 10^{-2} μ mol/mm^3.

In yet another aspect of the invention, an inert gas is contained in the high pressure discharge lamp with a pressure of about 6 kPa or more.

In yet another aspect of the invention, the pair of electrodes uses tungsten containing potassium oxide.

In yet another aspect of the invention, the bulb wall loading in the high pressure discharge lamp is about 0.8 W/mm^2 or more.

In yet another aspect of the invention, the end portion of each of the electrodes has a surface which is polished by a composite electrolytic polishing method.

BRIEF DESCRIPTION OF THE DRAWINGS

Some of the features and advantages of the invention have been described, and others will become apparent from the detailed description which follows and from the accompanying drawings, in which:

FIG. 1 is a diagram showing a schematic cross-sectional view of a high pressure discharge lamp according to an embodiment of the present invention;

FIG. 2 is a graph showing the relationship between the length L of a contacting

portion formed by sealing an electrode with a quartz glass bulb and the defect percentage where the power supplied to the high pressure discharge lamp is fixed at 200 (W) and the diameter ϕ of the electrode is varied among 0.4, 0.6, and 0.8 (mm);

FIG. 3 is a graph showing the relationship between the length L of a contacting portion formed by sealing an electrode with a quartz glass bulb and the defect percentage where the diameter ϕ of the electrode is fixed at 0.6 (mm) and the power supplied to the high pressure discharge lamp is varied among 200, 150, and 120 (W);

FIG. 4 is a graph showing the minimum length, L_{min}, where the diameter D of an electrode is in the range between 0.4 and 0.8 mm, and the maximum length, L_{max}, where the power supplied to the high pressure discharge lamp is 200 W, 150 W, and 120 W, respectively;

FIG. 5 is a diagram showing the schematic structure of a power supply system for a high pressure discharge lamp;

FIG. 6 is a graph showing the relationship between the maximum value, R_{max}, of the surface roughness of an electrode at a contacting surface and the defect percentage;

FIG. 7 is a diagram showing a schematic cross-sectional view of a high pressure discharge lamp according to an embodiment of the present invention;

FIG. 8 is a diagram showing a configuration of a conventional high pressure discharge lamp; and

FIG. 9 is a diagram showing a configuration of a conventional high pressure discharge lamp in which cracks are generated at the sealing portions.

DETAILED DESCRIPTION OF THE INVENTION

The invention summarized above and defined by the enumerated claims may be